

REMARKS

Claims 1-56 are pending in this application and presently stand rejected. Based on the above amendments and the following remarks, reconsideration and allowance of this application is respectfully requested.

Claim Rejections-35 U.S.C. §103

Claims 1-7, 9-17, 21, 24-29, 26-29, 31-37, and 49-50 have been rejected under 35 USC 103(a) as being unpatentable over Marques-Silva (“GRASP: A Search Algorithm for Propositional Satisfiability”), in view of Bayardo (“Using CSP Look-Back Techniques to Solve Real-World SAT Instances”).

As amended, claim 1 recites at least the following claim elements (Emphasis added):

(a) organizing a plurality of clauses in a satisfiability problem as a chronologically ordered structure comprising a top and a bottom, wherein newly deduced conflict clauses are added to the top of the structure, and maintaining individual activity counters for variables in the plurality of clauses, wherein the individual activity counters are based upon clauses that are involved with a conflict;

Applicants respectfully submit that the pending claims are not rendered obvious by the combination of Marques-Silva and Bayardo, since the references taken together do not disclose or suggest all of the claim elements. In particular, Applicants respectfully note that the combination of Marques-Silva and Bayardo do not disclose at least the claimed element “wherein the individual activity counters are based upon clauses that are involved with a conflict.”

Applicants acknowledge page 4 para. 1 of the Office Action, which states that Marques-Silva does not teach maintaining individual activity counters for variables in the plurality of clauses. Since Marques-Silva does not disclose individual activity counters, this reference cannot disclose “the individual activity counters are based upon clauses that are involved with a conflict” as is presently claimed.

Applicants respectfully suggest that Bayardo does not make up for this deficiency in Marques-Silva. Bayardo is directed to an enhancement of the Davis-Putnam (DP) proof procedure for propositional SAL solving which incorporates constraint satisfaction problem (CSP) look-back techniques. The specific approach in Bayardo is to improve the DP approach by applying a look-back enhanced version of the Tableau algorithm for 3SAT instances.

As amended, claim 1 recites that the “the individual activity counters are based upon clauses that are involved with a conflict.” The Office Action at page 4, para 2 asserts that Bayardo discloses “scores” at page 204, C2, Lines 15-31, which are understood by the Examiner to be activity counters. This section of Bayardo is reproduced below (emphasis added):

Modern variants of DP including POSIT and Tableau incorporate highly optimized unit propagators and sophisticated branch-variable selection heuristics. The branch-variable selection heuristic used by our implementation is inspired by the heuristics of POSIT and Tableau, though is somewhat simpler to reduce implementation burdens.

Details of branch-variable selection are as follows. If there are no binary clauses, select a branch variable at random. Otherwise, assign each variable  $\gamma$  appearing in some binary clause a score of  $\text{neg}(\gamma) \cdot \text{pos}(\gamma) + \text{neg}(\gamma) + \text{pos}(\gamma)$ , where  $\text{pos}(\gamma)$  and  $\text{neg}(\gamma)$  are the numbers of occurrences of  $\gamma$  and  $\neg\gamma$  in all binary clauses, respectively. Gather all variables within 20% of the best score into a candidate set. If there are more than 10 candidates, remove variables at random until there are exactly 10. If there is only one candidate, return it as the branch variable. Otherwise, each candidate is re-scored as follows. For a candidate  $\gamma$ , compute  $\text{pos}(\gamma)$  and  $\text{neg}(\gamma)$  as the number of variables valued by UNIT-PROPAGATE after making the assignment  $\{\gamma\}$  and  $\{\neg\gamma\}$  respectively. Should either unit propagation lead to a contradiction, immediately return  $\gamma$  as the next branch variable and pursue the assignment for this variable which led to the contradiction. Otherwise, score  $\gamma$  using the same function as above. Should every candidate be scored without finding a contradiction, select a branch variable at random from those candidates within 10% of the best (newly computed) score.

Applicants note that this section of Bayardo does not use the term "activity counter" at all, and certainly does not equate the term "score" to "activity counter."

The Office Action asserts that the term "score" as used in this section of Bayardo is an activity counter as claimed, based upon paragraph 10 of the present application. Applicants note that the embodiment of the invention described at paragraph 10 specifically describes an activity counter as being based upon the activity of variables in conflict clauses.

Without any admission or acquiescence that a counter as used by Bayardo is the same as an activity counter as claimed, Applicants point out that the cited section of Bayardo, as highlighted in the underlined section reproduced from Bayardo above, fails to disclose or suggest in any way that a

“score” is obtained based upon variables in conflict clauses. In fact, Bayardo very specifically states that scoring is performed by counting occurrences in all binary clauses -- not conflict clauses. As such, Bayardo does not disclose individual activity counters as claimed.

To clarify this in the claims, claim 1 has been amended to include the recitation “wherein the individual activity counters are based upon clauses that are involved with a conflict.” As previously stated, Bayardo does not disclose or suggest in any way that scoring is performed based upon clauses in conflict. Rather, Bayardo makes it clear that its scoring is based upon all clauses, without any regard for which of the clauses are in conflict.

For at least this reason, Applicants respectfully submit that claim 1 is allowable over the combination of Marques-Silva and Bayardo. For at least this same reason, Applicants submit that independent claims 31 and 41 are allowable as well. Therefore, Applicants respectfully submit that dependent claims 2-30, 32-40, and 42-56 are allowable for at least the same reason.

Claims 54-56 have been rejected under 35 USC 103(a) as being unpatentable over Marques-Silva in view of Bayardo and further in view of Biere (“Symbolic Model Checking Using SAT Procedures Instead of BDDs”).

As stated above, neither Marques-Silva nor Bayardo disclose or suggest the claimed element of “wherein the individual activity counters are based upon clauses that are involved with a conflict.” Biere does not make up this deficiency in Marques-Silva and Bayardo. Biere is directed to applications of propositional decision procedures for hardware verification, using the Sato implementation of DP and the PROVER approach based on Stallmark’s method. However, Biere does not describe or suggest in any way the use of individual activity counters based upon conflict

clauses, as is presently claimed. As such, the combination of Marques-Silva, Bayardo, and Biere does not render the pending claims obvious.

CONCLUSION

Based on the foregoing, it is believed that, with entry of this amendment, all claims are now allowable and a Notice of Allowance is respectfully requested. If the Examiner has any questions or comments regarding this amendment, the Examiner is respectfully requested to contact the undersigned at (650) 849-4870.

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Respectfully submitted,

Dated: March 26, 2007

  
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